

## PATENT SPECIFICATION



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### PROVISIONAL SPECIFICATION.

#### An Improved Design of Piston for Internal Combustion Engines.

I, CHRISTOPHER WORTLEY KERRIDGE, of the Constructive Department, H.M. Dockyard, Portsmouth, a British subject, do hereby declare the nature of this invention to be as follows:—

This invention is an improved design of piston for use in those internal combustion engines which are fitted with detachable heads to the cylinders, and has for its object the saving in time and expense at present involved in the examination, cleaning or replacement of the piston rings, by rendering unnecessary the lifting of the whole cylinder block casting from the crank case or alternatively the withdrawal from the cylinder of the piston and connecting rod downwards *via* the base of the crank case removed for this purpose, the removal of the detachable cylinder head being all that is necessary in this connection.

In the accompanying drawing is shown a piston according to my invention.

The piston itself is composed of two parts A & B. The part B is similar to the ordinary piston in as far as its housing of the gudgeon pin and connecting rod are concerned; it is, however,

machined down on its upper part to 30 take a detachable cap A which latter carries all the piston rings. A is secured to B by the screw C which latter is screwed into B as shown on the drawing. The head of the screw C is fitted to take 35 a locking ring. A is also prevented from rotating upon B by a locating stud.

The operation is carried out as follows:—

The detachable cylinder head is first 40 removed in the manner customary when decarbonizing an engine, thus exposing the tops of the pistons. The locking ring in the screw C is removed and C is then screwed out thus disconnecting 45 the cap A from the part B. The cap A is then disengaged from B by a special tool and withdrawn from the top of the cylinder carrying the rings with it. The rings can then be removed from A, the 50 grooves and rings cleaned and the rings examined, adjusted or renewed as necessary.

To replace the cap A the above operations are reversed. 55

Dated this 27th day of September, 1922.

C. W. KERRIDGE.

### COMPLETE SPECIFICATION.

#### An Improved Design of Piston for Internal Combustion Engines.

I, CHRISTOPHER WORTLEY KERRIDGE, of the Constructive Department, H.M. Dockyard, Portsmouth, a British subject, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention is an improved design of piston for use in those internal combustion four-stroke-cycle engines which

are fitted with detachable cylinder heads and, although not so limited, is more 70 particularly intended for use in motor car engines of the type referred to above in which also the main cylinder block casting is in one piece with the upper part of the crank-case. 75

This invention has for its object the saving in time and expense at present involved in the examination, cleaning, adjustment or replacement of

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the piston rings by rendering unnecessary the lifting of the whole cylinder block casting from the crank-case for this purpose, or alternatively—in the case of those four-stroke-cycle engines in which the cylinder block and upper part of the crank case are in one as aforesaid—by rendering unnecessary the operation of disconnecting the big end of the connecting rod and withdrawing from the cylinder the piston and connecting rod downwards *via* the base of the crank-case, the sump of which latter has necessarily to be removed before the latter operation can be carried out.

With the type of piston covered by this invention the removal of the detachable cylinder head is all that is necessary in the way of preliminary work to enable access to be had to the rings.

The invention is confined to internal combustion four-stroke-cycle engines in which the cylinders are fitted with detachable tops. It consists of a detachable cap to the piston which cap carries all the piston rings and can be removed *via* the top of the cylinder after the detachable head only is removed. The said cap is in the form of a cup, the open end of which fits over a skeleton top to the piston main body the top of the cap being the only gastight partition in a plane square to the axis of the cylinder in the whole of the moving piston.

The said cap is fitted with grooves which carry all the piston rings and is secured to a stud by a nut and bush, accessible after the removal of the cylinder head only, the stud being fixed in the skeleton top of the main piston body in the manner hereinafter described and illustrated.

This device differs from certain other inventions in which a detachable top to the piston carrying all the piston rings is fitted in that the open end of the detachable top to the piston is in the form of a cup which fits over the main body of the piston.

It differs from other inventions in which a detachable cap or part carrying the rings is fitted to the piston in that the said cap together with all the rings can be removed from the main body of the piston without the necessity of removing the whole piston from the cylinder in order to obtain access to the means by which the cap or part carrying the rings is secured to the main body of the piston.

It differs from certain other inventions in which a part of the piston carrying the rings is detachable or removable *via* the top of the cylinder without the necessity of first removing the piston from the cylinder in that the rigidity of the piston in the cylinder is preserved owing to the

fact that the main bearing surfaces of the piston in the cylinder are part of the same casting or part as the gudgeon pin bearings whereas in the former inventions referred to the stresses from the gudgeon pin bearings are conveyed to the cylinder walls wholly through a detachable piston shell which latter is wholly removable from the part carrying the gudgeon pin bearings and not part thereof.

In the accompanying drawing is shown a piston according to my invention.

Figure 1 represents two vertical sections of the piston, one in the plane of the gudgeon pin axis and the other at right angles to it. Figure 2 is a plan of the detachable cap A. Figure 3 is a plan of the skeleton top of the piston B with cap A removed. Figure 4 is a general elevation of the tool for withdrawing A from B.

The piston itself is composed of two principal parts A and B as shown on the drawing. The part B generally resembles the ordinary type of piston in so far as its lower parts are concerned. It is, however, machined down on its upper part to take a detachable cap A which latter carries all the piston rings. The upper part of B is also lightened by holes marked C both on its top and sides, where covered by the cap A, in such a manner that this upper part of B consists practically of a skeleton frame, thus contributing towards compensation for the added weight of the cap A.

The cap A may either be made shallow enough to terminate above the gudgeon pin, as in the type illustrated in the drawing, or it may be made sufficiently deep, if desired, to cover also the gudgeon pin holes, in which case its use obviates the necessity for fitting any of the usual locking arrangements to the gudgeon pin.

The cap A is secured to B by the nut D on the stud E which latter is screwed permanently into B as indicated on the drawing. The nut D may be drilled to take a wire locking pin. The screwed bush F surrounding the stud E is screwed into A as shown and merely serves to fill the gap between the stud E and the cap A the gap between A and E and the thread on A being intended respectively for insertion of and engagement with the screwed end of the special tool G, which latter is a necessary accessory by means of which the cap A is withdrawn from B.

The cupped end of the tool G is slightly countersunk to fit the top of the bush F and contains two small projections for engagement in the saw cuts in the bush F when unscrewing F from the cap A.

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5 The screwed end of tool G is made hollow to enable it to be passed over the stud E when it is screwed into the thread in A vacated by the bush F when the latter has been removed. When the screwed end of G has been screwed so far into A that its lower extremity bears against the top of B on continuing the revolution of G the cap A will ride up upon G and is 10 thus drawn off the main piston body B.

10 In order to prevent any rotation of A relative to B when A is being drawn from B by the tool G and also to prevent rotation of A when the screwed bush F is 15 being screwed in or out of A the cap A is fitted with two keys situated diametrically opposite each other and lying in the plane of the gudgeon pin axis. These 20 keys engage in keyways H cut in the part B and thus prevent A from rotating upon B.

20 In order to guard against inconvenience when replacing A caused by a chip of carbon deposit falling down the man- 25 lular space between the cylinder wall and B when the cap A is removed the shoulder on B is bevelled off at K so as to form a small V groove between the lower edge of A and the part B. Any such chips, 30 if they could not readily be recovered, would then merely lie in this groove and not in any way prevent A from being screwed right down upon B.

35 The operation is effected in the following manner:—

40 The detachable cylinder head is first removed in the manner customary when decarbonising an engine, thus exposing the tops of the caps A. The locking wire or pin is then withdrawn from the nut D and the nut D then unscrewed from the stud E. The screwed bush F is then unscrewed from A by means of the cupped end of the special tool G. The 45 screwed end of the special tool G is then screwed into the space vacated by F and on continuing the revolution of G the cap A rides up upon the screw on G and is thus withdrawn from B. The 50 rings can then be removed from A, the grooves and rigs cleaned and the rings themselves examined, adjusted or renewed as may be necessary.

55 The cap A can then be replaced by engaging the keys thereon with the key-

ways in B and gently tapping it down. The bush F is then screwed down tight and the nut D also. The pin is replaced, after which the detachable cylinder head is replaced and bolted down on to the cylinder block. 60

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is:— 65

1. In an internal combustion four-stroke-cycle engine of the type fitted with a detachable cylinder head and a removable cap to the main piston body which latter being in one part with the gudgeon pin bearings carries the main lands or bearing surfaces of the piston, the top of the said cap forming the only gas-tight partition in a plane square to the axis of the cylinder in the whole moving piston and the barrel of the said cap being fitted with grooves to carry all the piston rings, the cupped end of the cap fitting over the top of the main piston body and being secured to the latter in such a manner as to enable the cap to be removed from the cylinder for any purpose such as cleaning, adjustment or renewal of the rings and to be finally replaced without the necessity of any preliminary operation other than the removal of the detachable cylinder top from the cylinder and the removal of the piston cap from the piston. 70

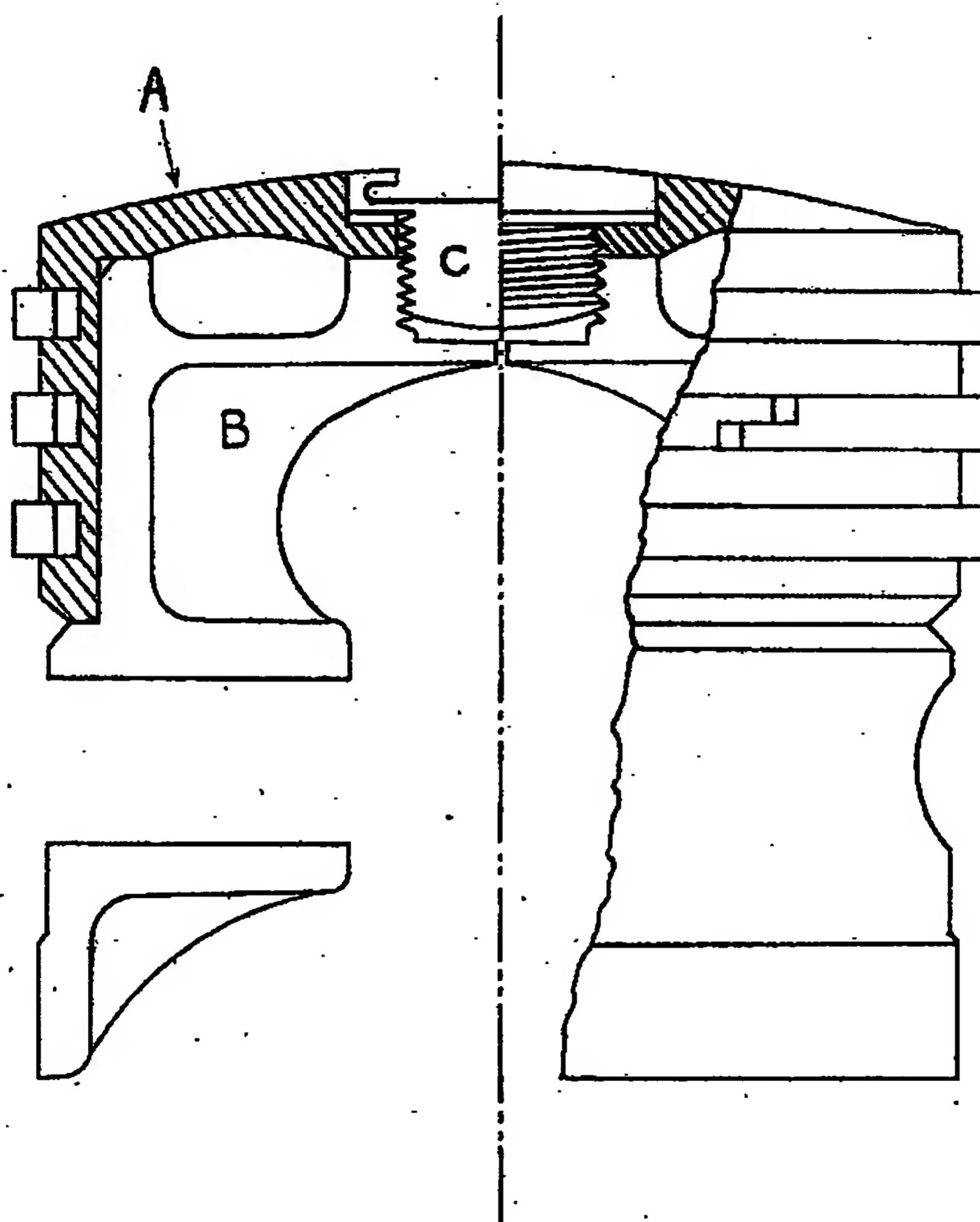
2. In a piston constructed in accordance with Claim 1 openings in the skeleton top of the main body of the piston enabling inspection to be made of the inside of the piston and the small end of the connecting rod. 75

3. In a piston constructed in accordance with Claim 1 the securing of the detachable cap by means of a coned nut screwed down upon a stud in the top of the main body of the piston which stud is surrounded by a bush screwed into the cap and countersunk on its upper part into which the coned nut descends thus tending to expand the bush in the cap forming a secure method of fastening the detachable piston cap to the piston. 100-105

Dated the 1st day of March, 1923.

C. W. KERRIDGE.

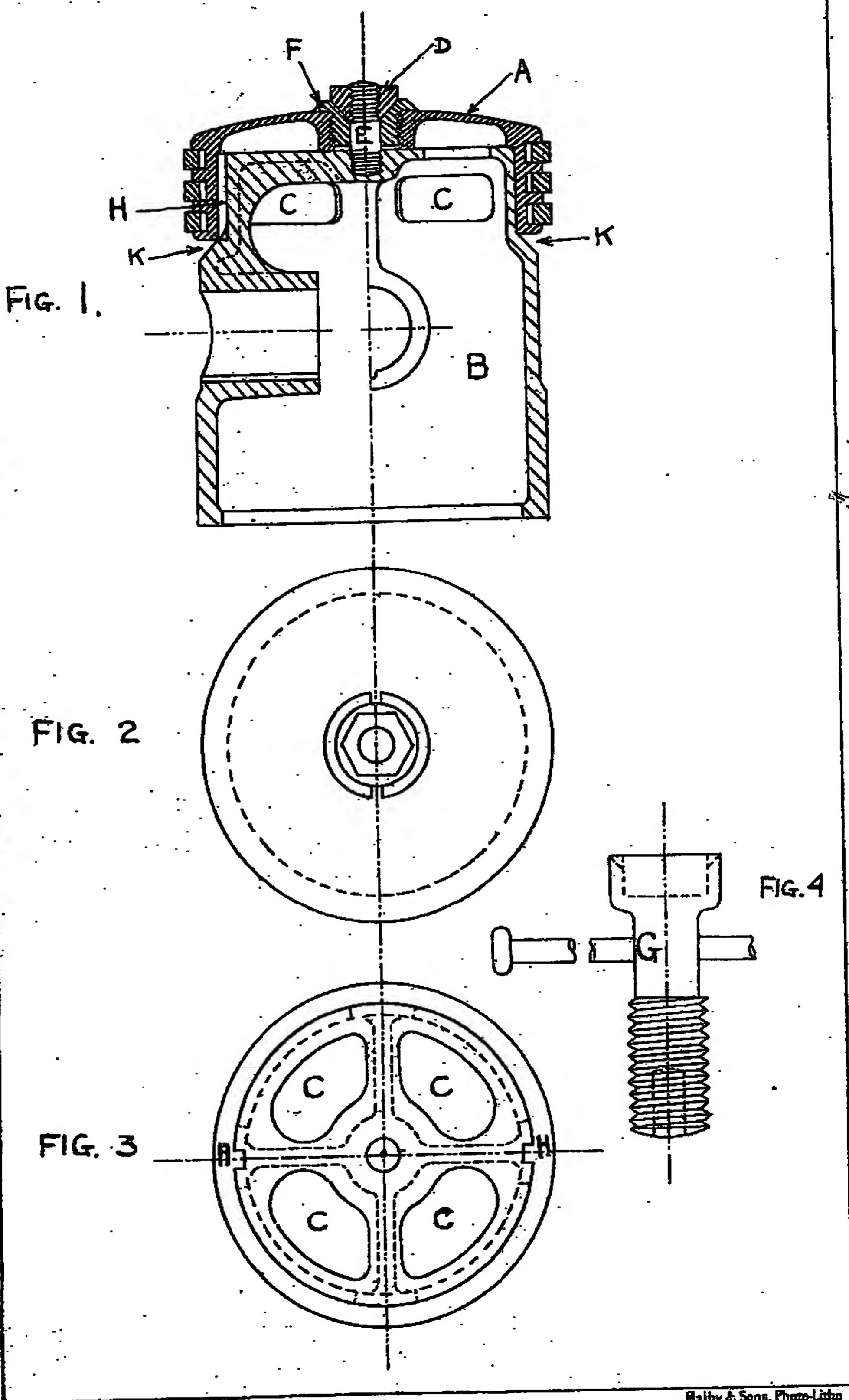
*[This Drawing is a full-size reproduction of the Original.]*



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